AMENDMENTS TO THE SPECIFICATION

On page 9, delete paragraph [0037] and replace it with the following:

[0037] Each optical amplifier in the WDM network is conventionally operating in an automatic gain control (AGC) mode: as an input power to the optical amplifier changes, the optical amplifier is regulated to keep constant gain by adjusting an operating current of at least one pump laser 132, for example, or by adjusting other operating parameters to alter pump power such as an attenuation of a variable optical attenuator in a feedback loop. However, the process for the amplifier to settle down (i.e., to reach a stable AGC mode of operation) due to input power change is quite slow, up to milliseconds or even minutes. The slow reaction time is a result of the relatively long lifetime of excited rare earth ions (e.g., Er 3+) used in most optical amplifiers, the limited speed of the amplifier gain control circuitry 138 and the typically complicated control algorithms required.

On page 10, delete paragraph [0040] and replace it with the following:

[0040] To overcome the drawbacks of the prior art approaches, the method and apparatus of the present invention offer a simple, fast, and very low cost approach. Referring to FIG. 1, when LOS is detected in Link 1 102, the receiver amplifier 114 is kept in operation and automatically becomes a noise source. Preferably, the pump power of the pump laser 132 which pumps the amplifier 114 is immediately increased to a predetermined target level. Operating the at least one pump laser 132 at the predetermined target level of pump power generates a predetermined target level of output noise power from the amplifier 114. By generating noise substantially equal to the target level of output noise power, the receiver amplifier 114 in the OADM node 112 compensates for the

LOS at the input of downstream transmitter amplifier 122 due to upstream fiber cut or network equipment failure.

On page 10, delete paragraph [0042] and replace it with the following:

[0042] The receiver amplifier 114 formed in accordance with the present invention preferably has several decibels (dB) of extra pump power available beyond that needed for normal WDM transmission. The output noise power is preferably increased to the target level of output noise power by increasing the pump power of at least one pump laser 132 in a control loop of the amplifier 114. The receiver amplifier 114 is preferably a low power amplifier which can be pumped to a highly saturated regime once the pump power is increased by several dB. In operation during LOS, the receiver amplifier 114 preferably produces high output noise power when operating in the saturated regime and at a constant pump power.

Starting on page 11 and ending on page 12, delete paragraph [0046] and replace it with the following:

[0046] The LOS is detected at an optical tap 134 ~~(not shown in FIG. 1)~~ placed in the upstream optical fiber link, which constantly monitors input signal power to the receiver amplifier 114 in the node. Preferably, the optical tap 134 is placed at the input of the receiver amplifier 114 in the node 112. Predetermined target levels of the pump power and the corresponding calculated operating parameters of the receiver amplifier required to achieve predetermined target levels of output noise are preferably stored in local data storage 140 for use in case of upstream fiber cut or equipment failure. These stored operating parameters allow fast feed forward control of the receiver amplifier 114.

On page 12, delete paragraphs [0047] and [0048] and replace them with the following:

[0047] The stored operating parameters of the receiver amplifier 114 required to achieve the target levels after LOS are preferably used in a one-step feed forward control loop. A feed forward control system is distinguished from a feedback system in that the feed forward control system response is based on measured input power (or loss thereof) to the optical amplifier, rather than on the measured output. In conjunction with stored parameters in the nature of a look-up table, the feed forward control system can then implement immediate adjustments to the amplifier operation in response to LOS. The response time of the fast feed forward control circuit 136 of the present invention is preferably less than about 10 microseconds to ensure error-free transmission for the surviving channels.

[0048] Since the predetermined target level of the pump power is calculated and stored after the channel provisioning in the node and before LOS, the one-step feed forward control coupled with a simple and fast control circuit 136 enables the entire control process to be advantageously very short (e.g., in a range of several to hundreds of microseconds) in comparison to conventional methods such as the pump control methods.

On page 13, delete paragraphs [0050] and [0051] and replace them with the following:

[0050] At step 206, LOS is detected when there is fiber cut or equipment failure in Link 1 102. At step 208, the pump power of receiver amplifier 114 is immediately increased to the calculated value found in step 204 through fast feed forward control circuitry 136. The in-line amplifiers 108 in Link 1 102 and the transmitter amplifier 130 in Node A 104 may be shut down immediately once LOS is detected. At step 210, the receiver amplifier 114 is regulated as a constant

noise source, in this embodiment, using an automatic power control mode in circuitry 136 to maintain constant noise power.

[0051] At step 212, the receiver amplifier 114 is shut down very slowly (in the range of milliseconds to minutes) after LOS preferably by slowly reducing the pump powers. Preferably, the pump powers are reduced after the transient effect from LOS has settled down, and network performance has stabilized. The speed at which shut down proceeds is preferably determined by the automatic gain control (AGC) speed and SRS tilting control speed for the downstream transmitter amplifier 122 and in-line amplifiers 126. Preferably, the speed of shutdown of the amplifier 114 is much slower than control circuitry 136 of downstream components. At step 214, the OADM module 116 is adjusted according to updated channel loading or provisioning configuration and/or to prepare to recover the network. Optionally, the receiver amplifier 114 may continue to operate as a high power noise source rather than be slowly shut down as in step 212 until other control steps or means of intervention are implemented.